



Fermilab

\bar{p} Note #361

Booster Long-3 Extraction Line

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The purpose of this note is to describe the proposed components of an extraction system at Long Straight 3 and the major elements in the extracted beam line up to the target vault. Cost estimates for these components will be included where possible. The purpose and optical design of the line are described elsewhere.¹

The extraction system at Long-3 will basically duplicate the present extraction system at L-13. This consists of two pairs of water cooled dipole magnets (Dog Leg Magnets) and a vertical septum magnet. The dog leg magnets bend the beam around the septum at injection to reduce beam loss caused by the "large" injected beam scraping on the septum. The major change from Long-13 will be increasing the bend angle of the septum to 50mrad from the 40mrad angle used at L-13.

Kicker magnets at Long-2, like those at Long-12, will be used to kick the beam up "1" into the septum magnet. It is currently thought that two of the four kickers at Long-12 can be used in conjunction with only 2 kickers at Long-2 to provide the necessary kick. This is still to be confirmed by studies of transporting the beam to Long-2 after kicking it at Long-12.

The extracted beam line will rise to ~18." above the booster center line and then be bent downward by 60 mr by a 5 ft. EPB dipole (BB1) suspended from the booster tunnel ceiling. Three small aperture TEV I quads (BQ1 - BQ3) then focus the beam as it is transported to the hole in the wall of the booster enclosure at an elevation of ~5.5 feet above the booster floor. This means a minimum clearance of 4.3 feet under the quads. Two horizontal trim magnets (HT) would allow correction of position or angle errors.

Beyond the hole in the wall the beam passes through two more 5' vertical dipoles immediately preceding the target. These two dipoles in conjunction with the EPB will be used to vary the targetting angle.

Diagnostics for establishing beam position for targetting and extraction tuning are also being considered. Single wire scanners (one horizontal and one vertical) are proposed for the upstream end of the septum for extraction setup. A multiwire (MW) downstream of the septum in the extracted beam line is also proposed as well as another multiwire (or two) after the vertical dipole to establish correct beam positions for targetting.

Vacuum valves are necessary to isolate the septum from both the booster ring and the extracted beam pipe. Additional valves between two of the quadrupoles would allow removal of a section of beam pipe for use of the booster tunnel for passage of maintenance equipment.

Figures 1 and 2 show a schematic of the line as described here up to the hole in the wall of the booster. Table 1 itemizes major components with estimated costs.

¹ Design Report Tevatron I Project, pp. 11-7 - 11-10.

TABLE I
COST ESTIMATES

Vertical Septum (existing)	\$ 20,000
Power Supply	60,000
Doglegs	12,000
Power Supply	21,900
5' EPB Dipole (existing)	12,000
Power Supply	21,900
3 Small Aperture Quads	90,000
Power Supply	18,900
Horizontal Trim	1,000
Gate Valves (5)	5,000
MW Scanners (2)	10,000
Single Wire Scanners (existing)	_____
Kickers (2) (existing)	4,000
Power Supply	<u>45,000</u>
TOTAL	\$321,700

2-3

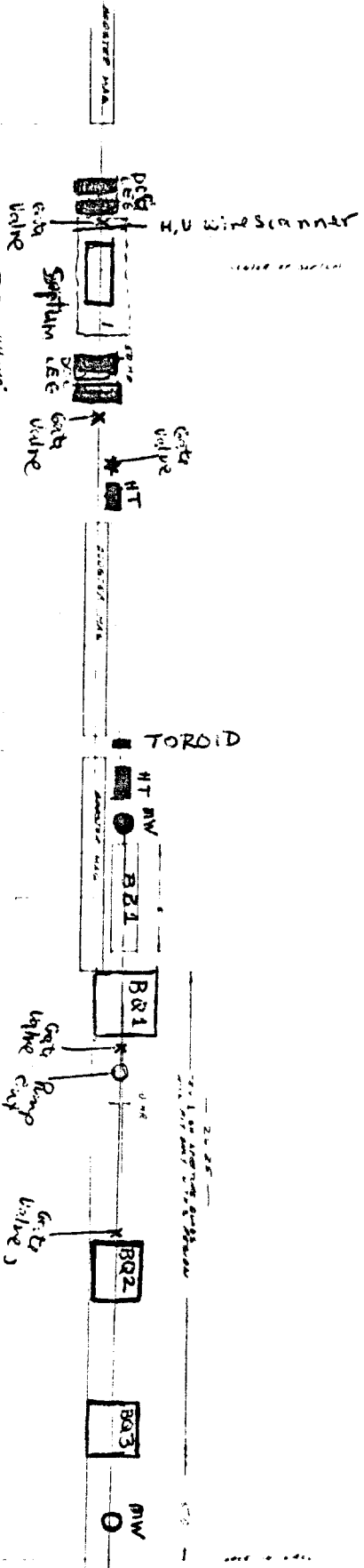
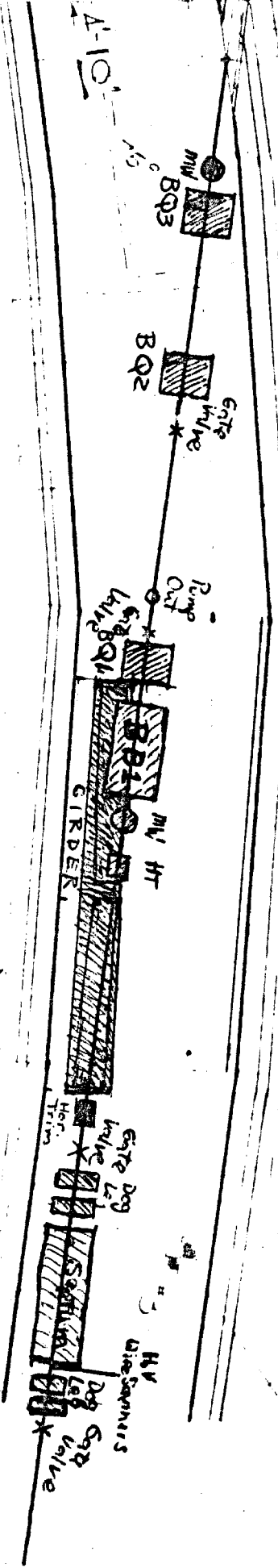


Figure 1

TITLE FIGURE 1	
DATE 10/1/54	DRAWN BY J. L. B.
CHECKED BY J. L. B.	APPROVED BY J. L. B.
PART NO. 100-100000-1	
QUANTITY 100	
MATERIAL ALUMINUM	
FINISH ANODIZED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
DIMENSIONS IN INCHES	
WEIGHT 10.0	
VOLUME 1.0	
SURFACE AREA 10.0	
COMMENTS SEE FIGURE 1	



TOE OF DAM

ENCLOSURE
HYDRAULIC

BEAM OR
GIRDER

BEAM OR
X=99 512
Y=99 307

Figure 2